

Ollscoil na hÉireann, Gaillimh

GX_____

National University of Ireland, Galway

Spring Examinations 2009

Exam Code(s)	3IF1
Exam(s)	3 rd B.Sc. In Information Technology
Module Code(s)	CT332
Module(s)	Database Systems II
Paper No.	
Repeat Paper	
External Examiner(s)	Dr. John A. Keane
Internal Examiner(s)	Prof. Gerard Lyons
	Mr. C. O'Riordan
Instructions	Answer any 3 questions All questions carry equal marks.
Duration	3 hours
No. of Answer books	1
No. of Pages	2
Department(s)	Information Technology

OLLSCOIL na hEIREANN
THE NATIONAL UNIVERSITY of IRELAND

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SPRING EXAMINATIONS 2009

Third University Examination in Information Technology

CT332 DATABASE SYSTEMS II

- Q.1.** i) Discuss the properties of a well designed relational schema. (6)
- ii) With respect to EER diagrams, explain the term *specialisation*. Describe the different types of specialisation and propose an appropriate mapping to a relational schema for each specialisation. Use appropriate examples in your answer. (11)

iii) Given $R = \{A, B, C, D, E, F, G, H, I\}$ and the following functional dependencies:

- $\{A, B, C\} \rightarrow \{D, E, F\}$
- $\{A, B\} \rightarrow \{G\}$
- $\{G\} \rightarrow \{B\}$
- $\{C\} \rightarrow \{H\}$
- $\{H\} \rightarrow \{I\}$

decompose R to a set of relations such that all relations satisfy BCNF. (8)

- iv) Explain, with the use of an example, the meaning of the term *non-additive join*. Illustrate, with an example, how might one test if a relational schema has the *non-additive join* property. (8)

- Q.2.** i) Explain briefly the importance of concurrency control in multi-user databases. Outline the problems that may arise if concurrency control is not enforced. (6)

ii) Two-phase locking and time-stamping are two alternative approaches used to guarantee correct concurrency control. Explain *either* approach. (9)

iii) What is meant by *conflict-serializability*. For either two-phase locking or timestamping, show how conflict-serializability is guaranteed. (8)

iv) Show how the following schedule would proceed under two phase locking *or* time-stamping.

Ta	Tb	Tc
		read_item(X)
		read_item(Y)
	read_item(Y)	
	read_item(Z)	
read_item(X)		
read_item(Z)		
	write_item(Y)	
		write_item(X)
write_item(Z)		

(10)

Q.3 i) Given the following company database schema:

EMPLOYEE:	<u>SSN</u> , Fname, Lname, Salary, Address, Age, Dno
DEPARTMENT:	<u>Dno</u> , Dname, Description
DEPT_LOCN:	<u>Dno</u> , <u>DLocation</u>
PROJECT:	<u>Pno</u> , Pname, Budget, Proj_Desc, Plocation
WORKS_ON:	<u>SSN</u> , <u>Pno</u> , Hours

provide an SQL query for the following:

List all employees (Fname, Lname) who work for a department based in “Dublin” *or* who have worked more than 10 hours on a project located in “Dublin”. (4)

Outline the process of heuristic optimisation. Develop an operator tree that represents an efficient evaluation strategy for the above query. (14)

ii) Describe algorithms that can be used for efficient evaluation of the set operators union and intersection. (8)

iii) Describe, with an example, a strategy that can be used for efficient evaluation of queries in a distributed database. (7)

Q.4. i) In parallel databases, relations may be distributed in different ways. These include *round-robin based approaches*, *hashing based approaches* and via the use of a *partitioning vector*. Describe these approaches and discuss their suitability for different types of queries. (8)

ii) With respect to Datalog, explain, with suitable examples, the notion of rule-safety. (7)

iii) With a schema of your choice, show how the relational operators can be implemented in Datalog. (9)

iv) Compare object-oriented and relational models – describe the differences in models and query languages supported. Your answer should also include the language constructs supported in the query languages associated with DBMSs adopting the models. (9)